SONY

SERVICE MANUAL

for

MICROPHONE HEADSET SYSTEM

DR-6020

May 1994

SONY CORPORATION, 7-35 Kitasinagawa 6-Chome, Sinagawa-ku, TOKYO, 141 Japan

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SERVICE MANUAL
FOR
MICROPHONE HEADSET SYSTEM DR-6020

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1. Description and Operation

A. General

(1) Scope

This service manual with illustrated parts list (IPL) covers the Sony corporation, DR-6020 microphone headset system.

B. System Configuration

This equipment is a microphone headset system to be used in the cockpit and cabin of a general aircraft. Connected to the audio communication system in the cockpit, it converts audio signals into electrical signals, or vice versa, permitting intercommunication inside the cockpit, between the cockpit and the cabin, and between the cockpit and a ground station. The system consists of a receiver MDR-7020, a microphone ECM-9035, ECM-9036, ECM-9030, ECM-9031, a receiver connecting cord RK-8010, RK-8011, RK-8020, RK-8021, RK-8015, RK-8016, RK-8025, RK-8026, and a plug-adaptor PC-8410.
These components can be used in combination according to the purpose. (See Table 1.)

C. Function and Features (See Figure 1.)

(1) MDR-7020

A dynamic type receiver with earpieces for both ears, equipped with connector jacks on both sides for convenient connection. Unlike with one ear receiver, using both ears means sound pressure levels are kept low, reducing ear fatigue to a minimum, and the open-ear design means that effects on the ears from changes in air pressure are also minimized.
The impedance of the receiver is 320 ohms.

(2) ECM-9030, ECM-9035

An electret condenser microphone (with built-in amplifier) which converts the MDR-7020 to a full microphone headset system. It employs a high-performance unidirectional electret condencer microphone unit at the end and a flexible pipe at the boom to permit the unit to be set in the most convenient position.
Moreover, thanks to a 180-degree rotatable function at the boom end, the microphone can be mounted on either the left or right side of the MDR-7020 for optimum voice pickup.
The microphone operates on 8 to 32 V DC (nominal 12 V DC). The nominal impedance is 150 ohms (AC load) and the matching impedance is 100 to 470 ohms.

(3) ECM-9031, ECM-9036

An electret condenser microphone (with built-in amplifier) which converts the MDR-7020 to a full microphone headset system. It employs a high-performance unidirectional electret condencer microphone unit at the end and a flexible pipe at the boom to permit the unit to be set in the most convenient position.
Moreover, thanks to a 180-degree rotatable function at the boom end, the microphone can be mounted on either the left or right side of the MDR-7020 for optimum voice pickup.
The microphone operates on 8 to 32 V DC (nominal 12 V DC). The nominal impedance is 150 ohms (AC load) and the matching impedance is 100 to 470 ohms. It has a resistor in the plug for connecting the receiver, and its receiver impedance is 600 ohms.

(4) RK-8010, 8015

A connecting cord for independent use of the receiver MDR-7020. It can be connected to either the left or right side of the MDR-7020 with the respective connector.

(5) RK-8020, 8025

A connecting cord for independent use of the receiver MDR-7020. It can be connected to either the left or right side of the MDR-7020 with the respective connector. It has curled portion.

(6) RK-8011, 8016

A connecting cord for independent use of the receiver MDR-7020. It can be connected to either the left or right side of the MDR-7020 with the respective connector. It has a resistor in the plug, and its receiver impedance is 600 ohms.

(7) RK-8021, 8026

A connecting cord for independent use of the receiver MDR-7020. It can be connected to either the left or right side of the MDR-7020 with the respective connector. It has curled portion and has a resistor in the plug. Its receiver impedance is 600 ohms.

(8) PC-8410
A plug adaptor with a push-to-talk switch which enables hand-operated control of transmission. It is connected between the microphone input jack of the aircraft intercom system and the microphone output plug of the ECM-9030, ECM-9031, ECM-9032, ECM-9035, ECM-9036. The transmitter will be active only while the switch button is pushed.

TABLE 1

DR-6020 Combination Example

In case of the receiver impedance is 320 ohms.

COMBINATION EXAMPLE	COMPONENTS USED	PURPOSE OF USE
1	MDR-7020, RK-8010 or MDR-7020, RK-8020 or MDR-7020, RK-8015 or MDR-7020, RK-8025	Independent use of the receiver (e. g. when using hand microphone)
2	MDR-7020, ECM-9030 or MDR-7020, ECM-9035	Intercommunication (e. g. when using push-to-talk switch on control yoke or audio panel)
3	MDR-7020, ECM-9030, PC-8410 or MDR-7020, ECM-9035, PC-8410	Intercommunication (For hand-operated control of transmission)

In case of the receiver impedance is 600 ohms.

COMBINATION EXAMPLE	COMPONENTS USED	PURPOSE OF USE
1	MDR-7020, RK-8011 or MDR-7020, RK-8021 or MDR-7020, RK-8016 or MDR-7020, RK-8026	Independent use of the receiver (e. g. when using hand microphone)
2	MDR-7020, ECM-9031 or MDR-7020, ECM-9036	Intercommunication (e. g. when using push-to-talk switch on control yoke or audio panel)
3	MDR-7020, ECM-9031, PC-8410 or MDR-7020, ECM-9036, PC-8410	Intercommunication (For hand-operated control of transmission)

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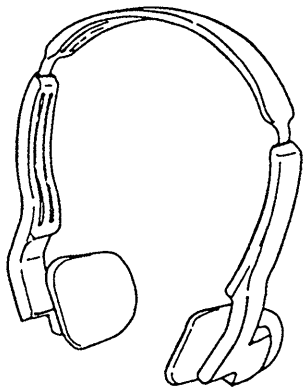
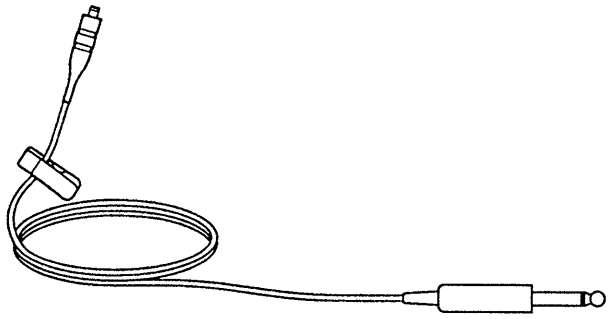
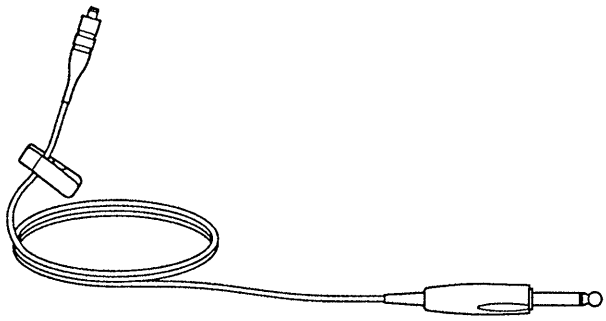
RECEIVER MDR-7020



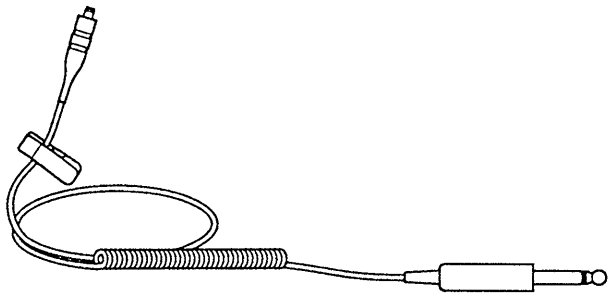
RECEIVER CONNECTING CORD RK-8010, RK-8011



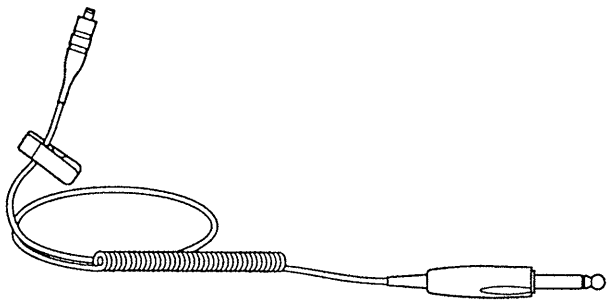
RECEIVER CONNECTING CORD RK-8015, RK-8016



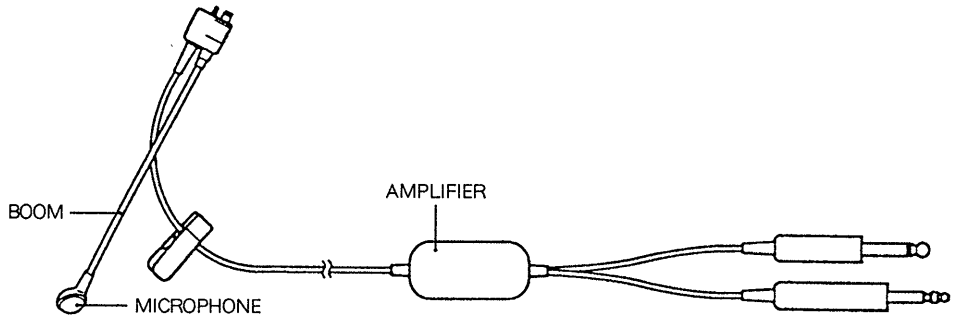
RECEIVER CONNECTING CORD RK-8020, RK-8021



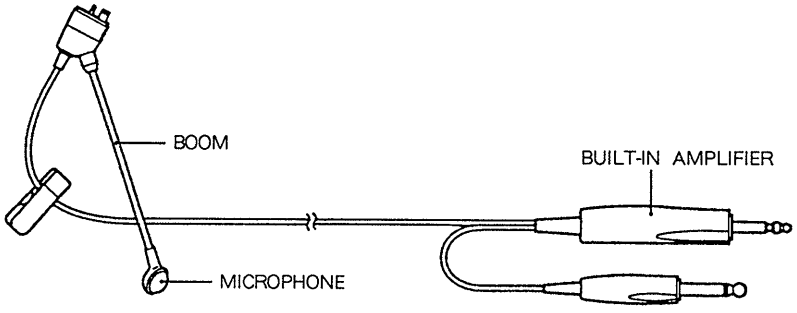
RECEIVER CONNECTING CORD RK-8025, RK-8026



MICROPHONE ECM-9030, ECM-9031



MICROPHONE ECM-9035, ECM-9036



PLUG ADAPTOR PC-8410

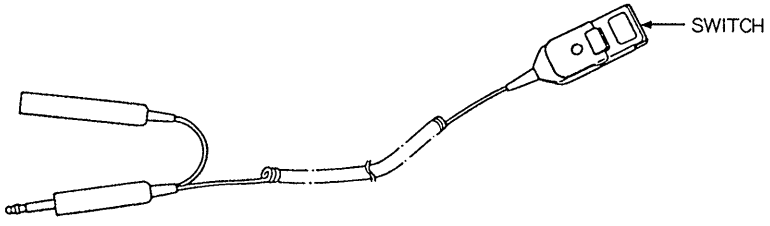
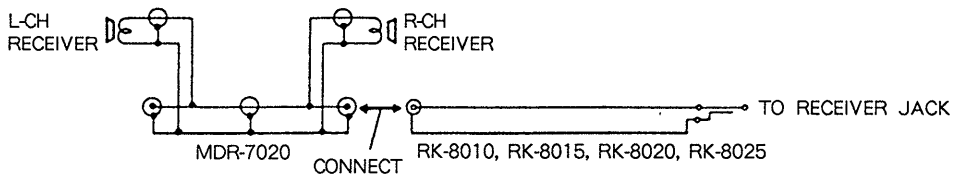
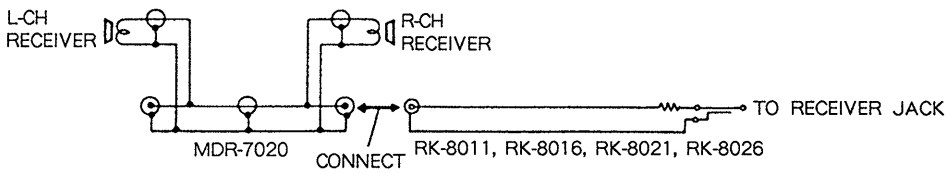


Figure 1. DR-6020 External Views

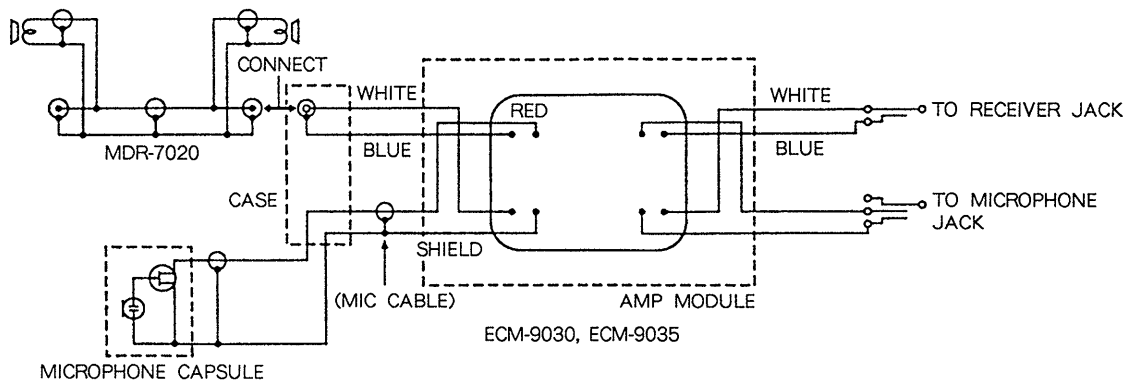
1. MDR-7020 and RK-8010, RK-8015, RK-8020, RK-8025



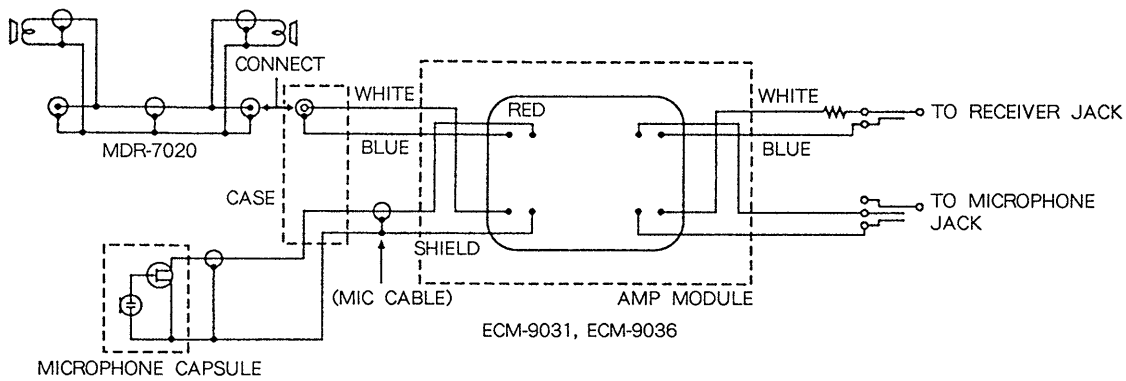
2. MDR-7020 and RK-8011, RK-8016, RK-8021, RK-8026



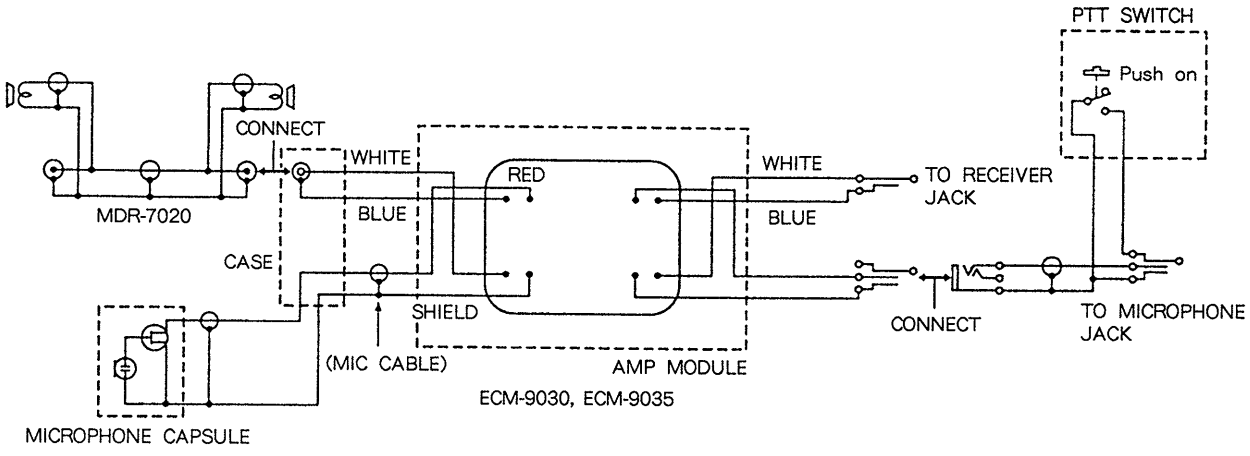
3. MDR-7020 and ECM-9030, ECM-9035



4. MDR-7020 and ECM-9031, ECM-9036



5. MDR-7020 and ECM-9030, ECM-9035 and PC-8410



6. MDR-7020 and ECM-9031, ECM-9036 and PC-8410

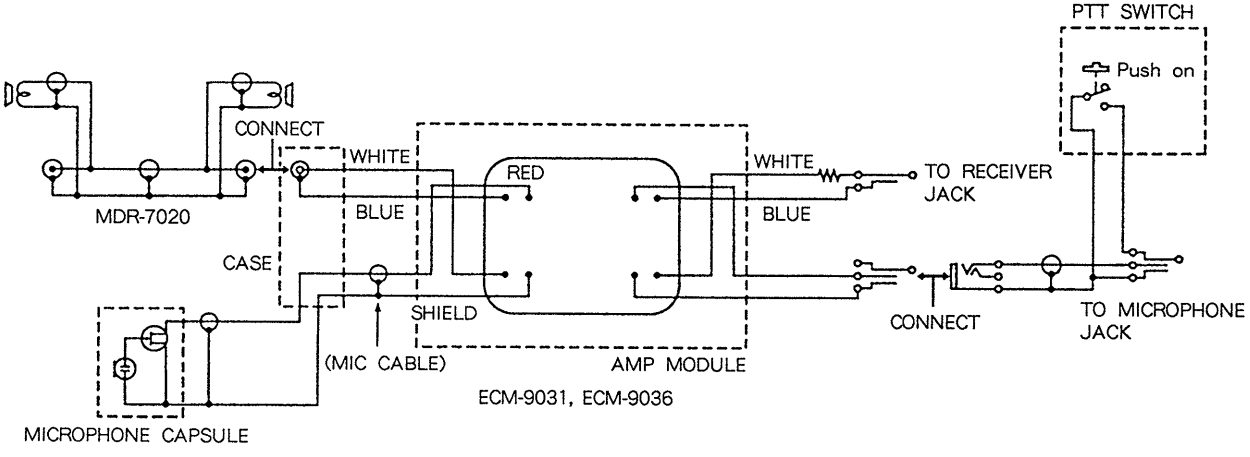


Figure 2. System Connection Charts

TABLE 2

Specifications

Receiver MDR-7020 and receiver connecting cord RK-8010, RK-8015, RK-8020, RK-8025

Sensitivity	100 ± 5 dB SPL (1000 Hz, 1 mWrms input)
Frequency response	350 – 3000 Hz ± 6 dB (1000 Hz = 0 dB)
Distortion	Less than 10% (350 – 3000 Hz, 110 dB SPL)
Impedance	320 ohms ± 20% (1000 Hz, by resistor substitution method)
Plug type	PJ-055U Compatible
Weight	MDR-7020: less than 88 g RK-8010: less than 43 g RK-8015: less than 42 g RK-8020: less than 50 g RK-8025: less than 48 g

Damage could occur to avionics equipment by the use of these headsets if the equipment was manufactured for use with only 600 ohms headsets – if in doubt, consult the avionics equipment manufacturer.

Receiver MDR-7020 and receiver connecting cord RK-8011, RK-8016, RK-8021, RK-8026

Sensitivity	97 ± 5 dB SPL (1000 Hz, 1 mWrms input)
Frequency response	350 – 3000 Hz ± 6 dB (1000 Hz = 0 dB)
Distortion	Less than 10% (350 – 3000 Hz, 110 dB SPL)
Impedance	600 ohms ± 20% (1000 Hz, by resistor substitution method)
Plug type	PJ-055U Compatible
Weight	MDR-7020: less than 88 g RK-8011: less than 48 g RK-8016: less than 45 g RK-8021: less than 55 g RK-8026: less than 51 g

Microphone ECM-9030, ECM-9031, ECM-9035, ECM-9036 and plug adaptor PC-8410

Sensitivity	400 mV ± 6 dB (1000 Hz, 114 dB SPL)
Frequency response	See microphone frequency response chart. (Figure 3)
Distortion	Less than 5% (350 – 6000 Hz, 114 dB SPL)
SN ratio	Better than 46 dB (114 dB SPL)
Matching impedance	100 – 470 ohms
Recommended load impedance	150 ohms (AC load)
Operating voltage	8 – 32 Vdc
Plug type	Microphone: PJ-068U Compatible Receiver: PJ-055U Compatible
Weight	ECM-9030, ECM-9035, ECM-9036: less than 110 g ECM-9031: less than 115 g PC-8410: less than 110 g

(Test: measured 6 mm from artificial voice lip ring)

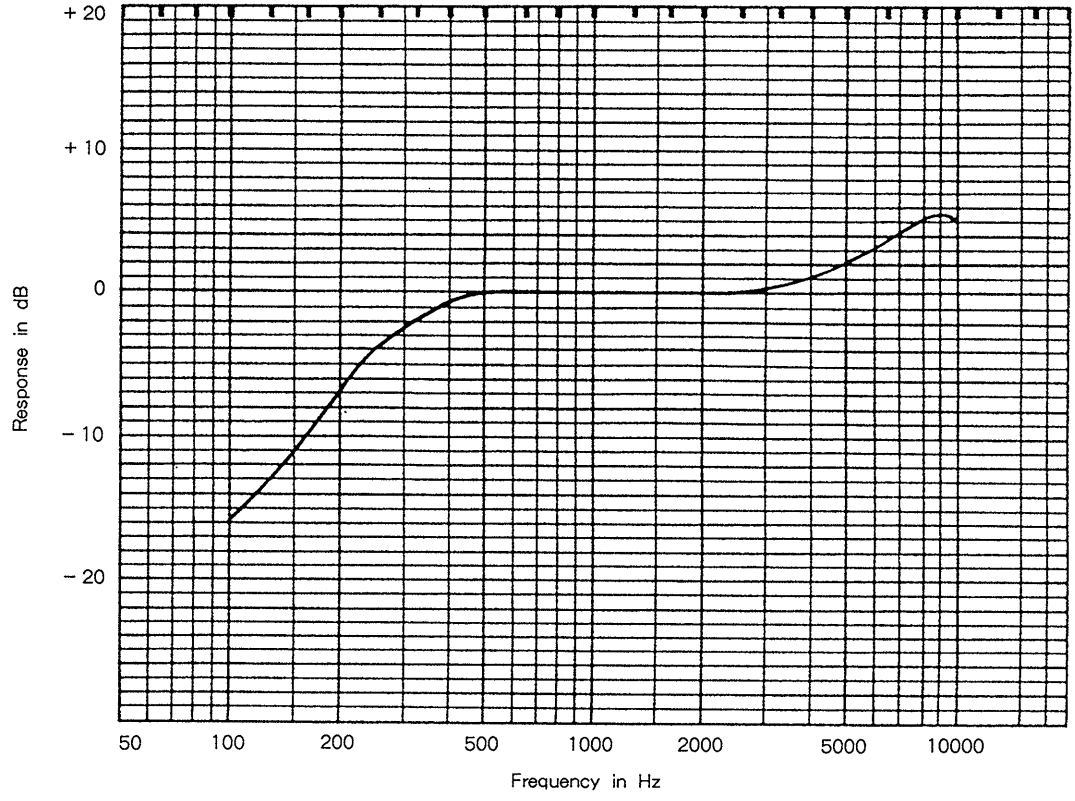


Figure 3. Microphone Frequency Response Chart (Typical)

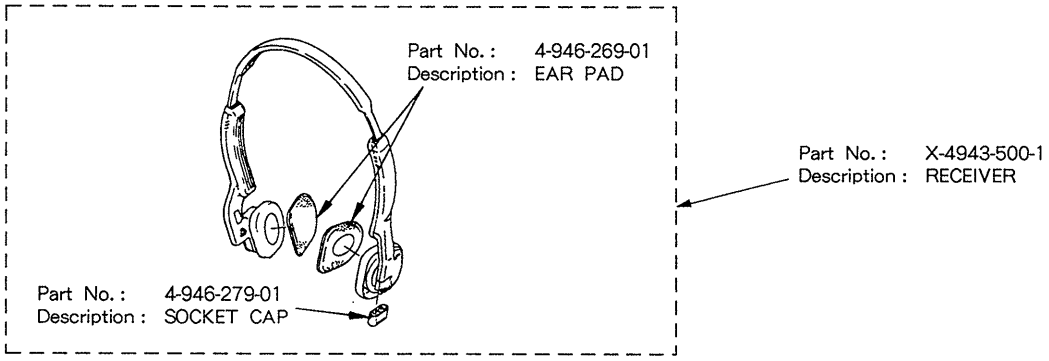
2. Service Method

DR-6020 consists of MDR-7020, ECM-9030, ECM-9031, ECM-9035, ECM-9036, RK-8010, RK-8011, RK-8015, RK-8016, RK-8020, RK-8021, RK-8025, RK-8026, and PC-8410.

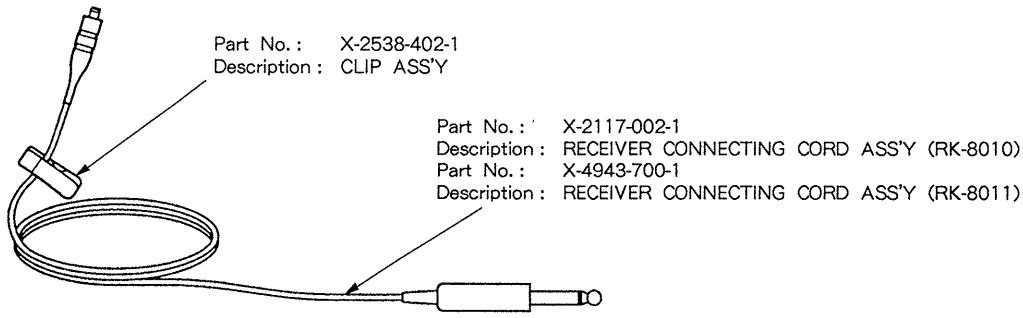
See next page and later for ECM-9030, ECM-9031, ECM-9035, ECM-9036.

Other models (MDR-7020, RK-8010, RK-8011, RK-8015, RK-8016, RK-8020, RK-8021, RK-8025, RK-8026, and PC-8410) are replaced with a unit.

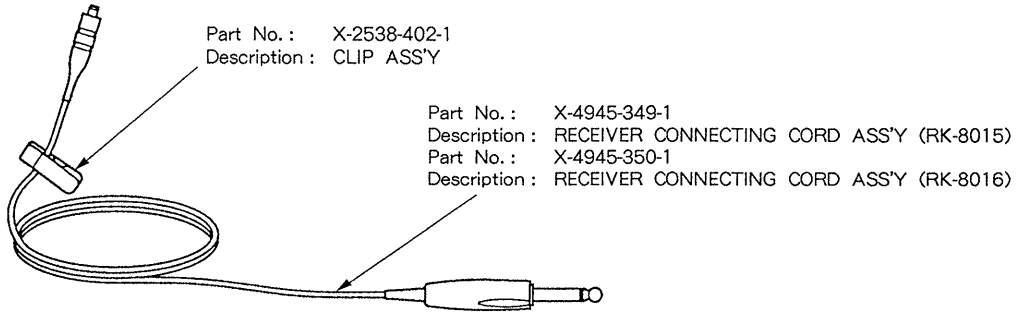
MDR-7020



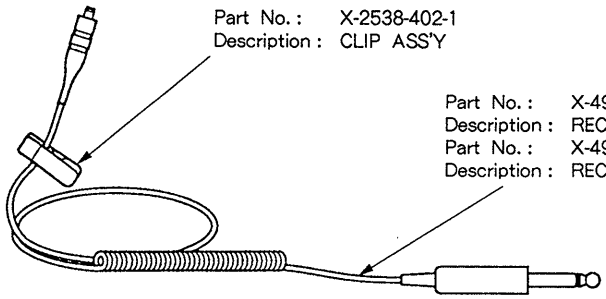
RK-8010, RK-8011


Part No. : X-2538-402-1
Description : CLIP ASS'Y
Part No. : X-2117-002-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8010)
Part No. : X-4943-700-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8011)

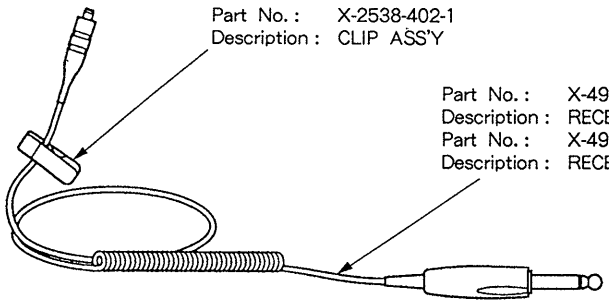
RK-8015, RK-8016


Part No. : X-2538-402-1
Description : CLIP ASS'Y
Part No. : X-4945-349-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8015)
Part No. : X-4945-350-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8016)

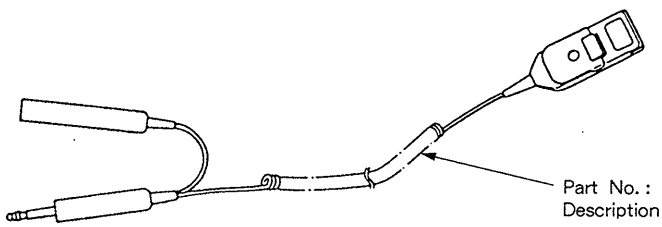
RK-8020, RK-8021


Part No. : X-2538-402-1
Description : CLIP ASS'Y
Part No. : X-4943-698-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8020)
Part No. : X-4943-699-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8021)

RK-8025, RK-8026


Part No. : X-2538-402-1
Description : CLIP ASS'Y
Part No. : X-4945-351-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8025)
Part No. : X-4945-352-1
Description : RECEIVER CONNECTING CORD ASS'Y (RK-8026)

PC-8410



3. Disassembly

MICROPHONE ECM-9030, ECM-9031 (See Figure 4.)

(1) Remove the amp casing (B) by unscrewing the screw.

(2) Take out the amp board mount from the amp casing (A).

(3) Unsolder the lead wires of the plug (A) ass'y, plug (B) ass'y, and microphone main-frame ass'y from the amp board mount.

(4) Remove the clamps from the plug (A) ass'y, plug (B) ass'y, and microphone main-frame ass'y.

(5) Pull out the bushing from the plug (A) ass'y and plug (B) ass'y.

(6) Pull out the case bushing from the microphone main-frame ass'y.

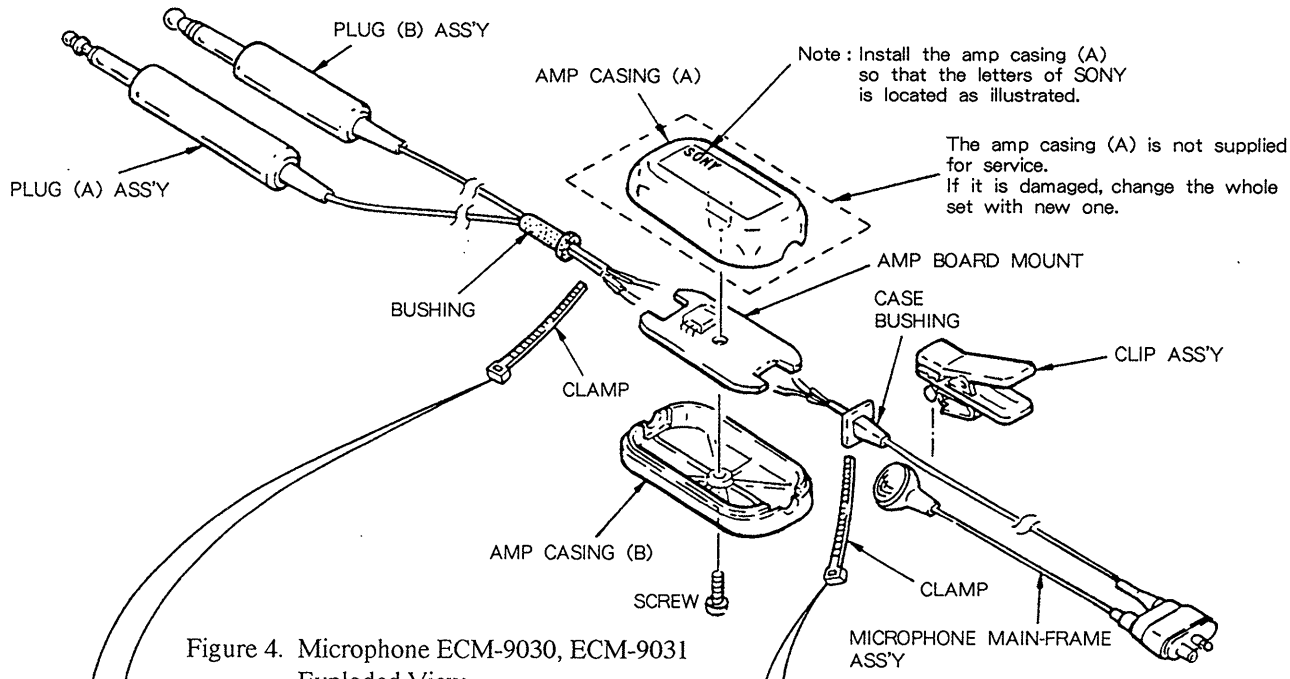

PLUG (B) ASS'Y
AMP CASING (A)
Note : Install the amp casing (A) so that the letters of SONY is located as illustrated.
The amp casing (A) is not supplied for service.
If it is damaged, change the whole set with new one.
PLUG (A) ASS'Y
AMP BOARD MOUNT
BUSHING
CASE BUSHING
CLIP ASS'Y
CLAMP
AMP CASING (B)
SCREW
CLAMP
MICROPHONE MAIN-FRAME ASS'Y

Figure 4. Microphone ECM-9030, ECM-9031 Exploded View

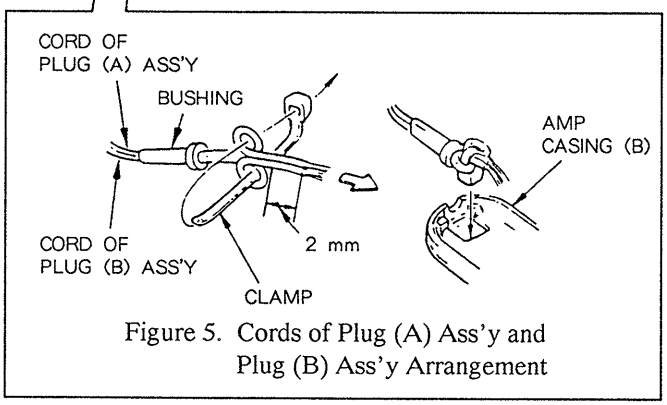


Figure 5. Cords of Plug (A) Ass'y and Plug (B) Ass'y Arrangement

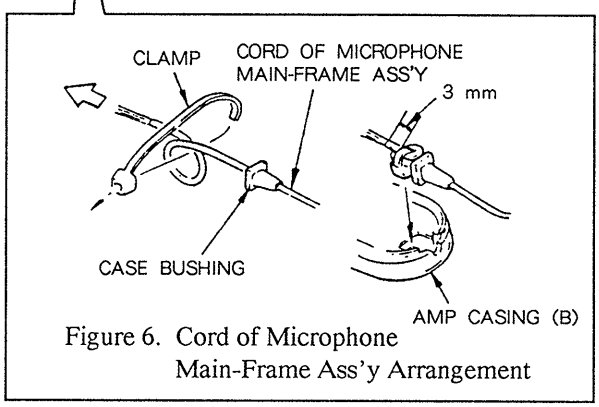


Figure 6. Cord of Microphone Main-Frame Ass'y Arrangement

MICROPHONE ECM-9035, ECM-9036 (See Figure 7.)

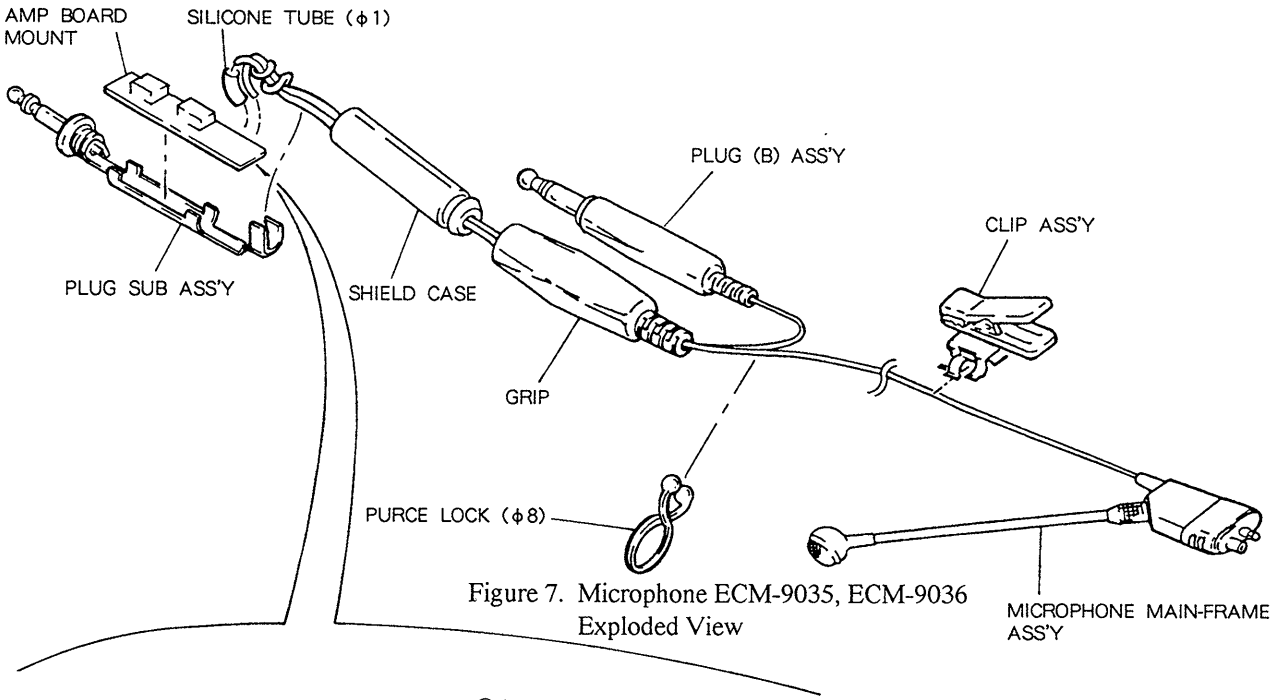


Figure 7. Microphone ECM-9035, ECM-9036 Exploded View

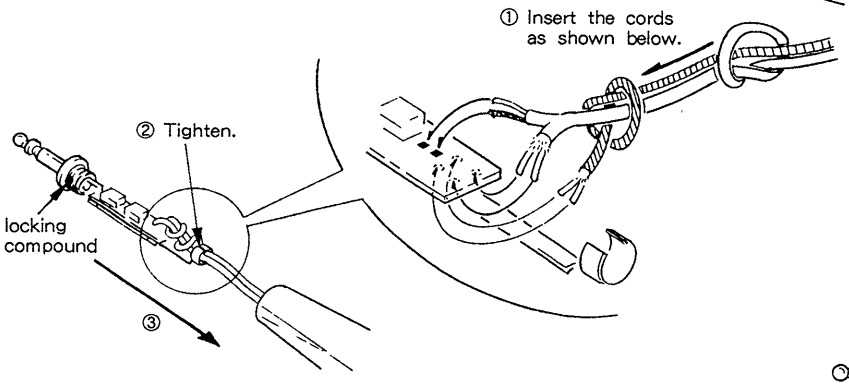


Figure 8. Cord Arrangement

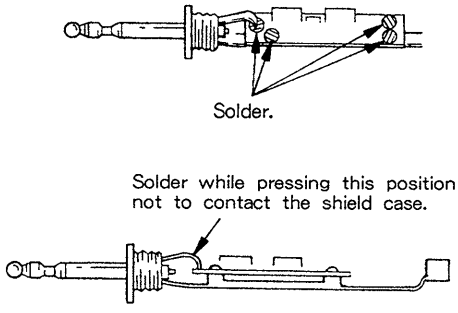


Figure 9. Soldering Position

4. Assembly

MICROPHONE ECM-9030, ECM-9031 (See Figure 4 through 6.)

(1) Pass through the cords of the plug (A) ass'y and plug (B) ass'y to the bushing. (See Figure 5.)

(2) Bundle the cords of the plug (A) ass'y and plug (B) ass'y by the clamp. (See Figure 5.)

(3) Solder the lead wires of the plug (A) ass'y and plug (B) ass'y to the amp board mount.

(4) Put the cords of the plug (A) ass'y and plug (B) ass'y in the amp casing (B).

(5) Pass through the cord of the microphone main-frame ass'y to the case bushing. (See Figure 6.)

(6) Bundle the cord of the microphone main-frame ass'y by the clamp. (See Figure 6.)

(7) Solder the lead wire of the microphone main-frame ass'y to the amp board mount.

(8) Put the cord of the microphone main-frame ass'y in the amp casing (B). (See Figure 6.)

(9) Assemble the amp casing (A) to the amp casing (B) by screwing the screw.

MICROPHONE ECM-9035, ECM-9036 (See Figure 7 through 9.)

Note: Amp board mount cannot be repaired. If it is damaged, change the amp board mount with new one. Circuit diagram is described for reference. (Figure 11, 13.)

ECM-9030, ECM-9031

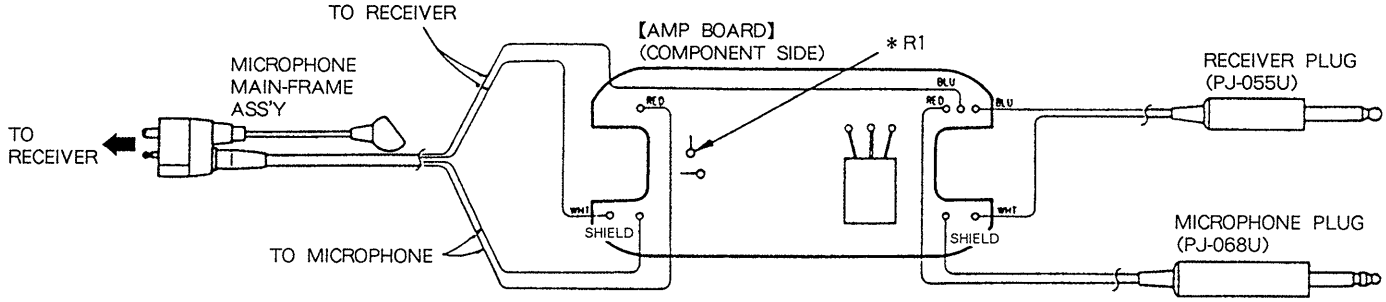


Figure 10. Microphone ECM-9030, ECM-9031 Wiring Diagram

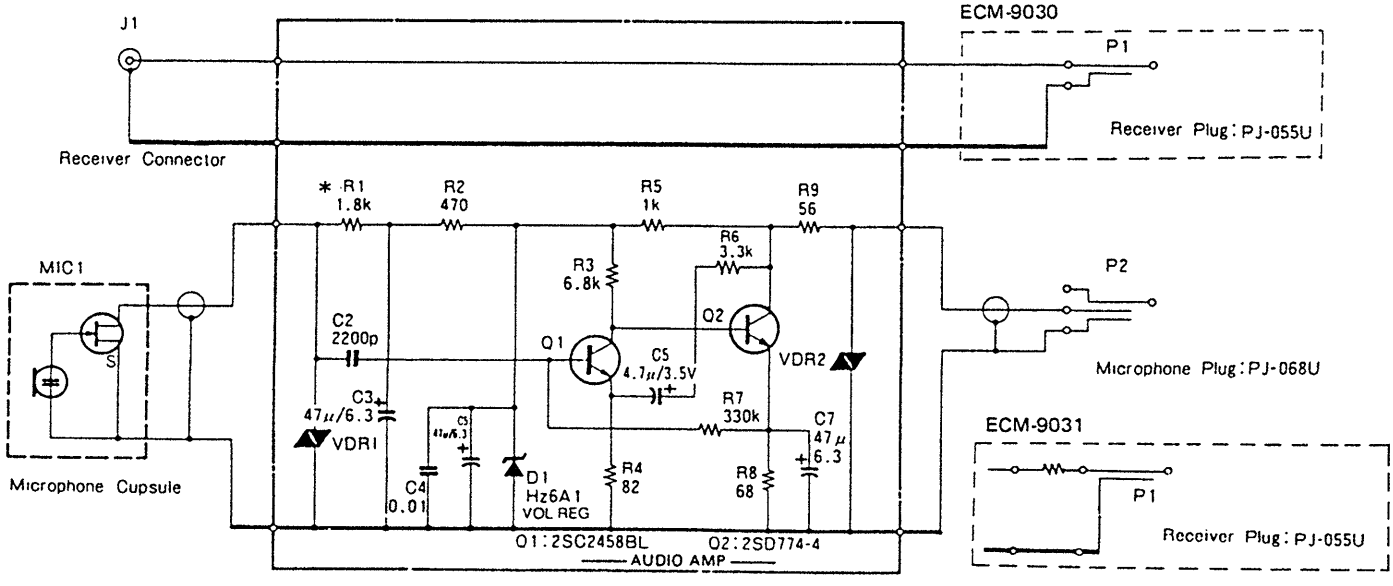


Figure 11. Microphone ECM-9030, ECM-9031 Circuit Diagram

* Note on replacing microphone main-frame ass'y and amp board mount

- When replacing the microphone main-frame ass'y, change R1 on the amp board mount with the resistor which value is 2.7 kΩ.
- When replacing the amp board mount with a new one, change R1 (2.7 kΩ) mounted on the new amp board mount with the resistor which value is the same as the one on the former amp board mount.

ECM-9035, ECM-9036

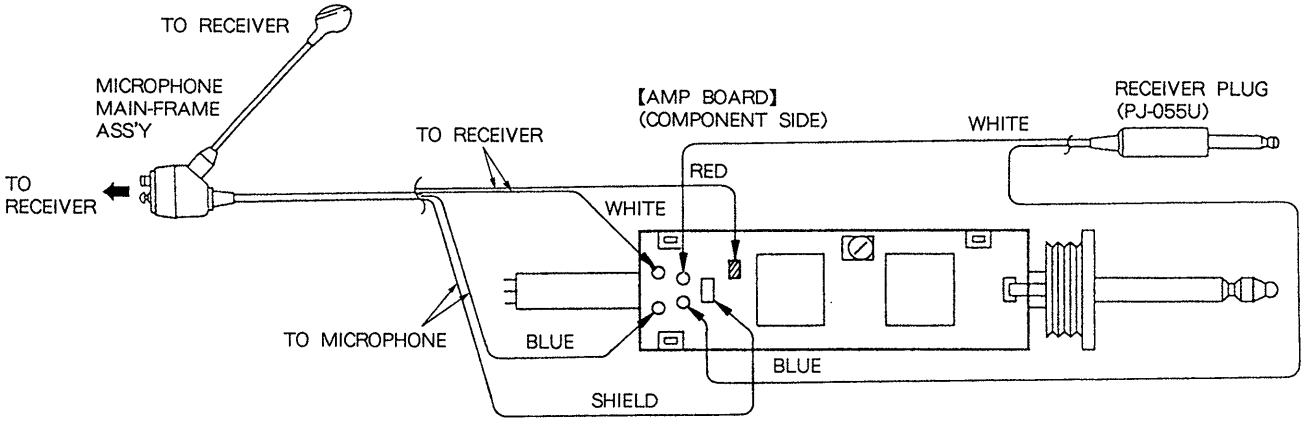


Figure 12. Microphone ECM-9035, ECM-9036 Wiring Diagram

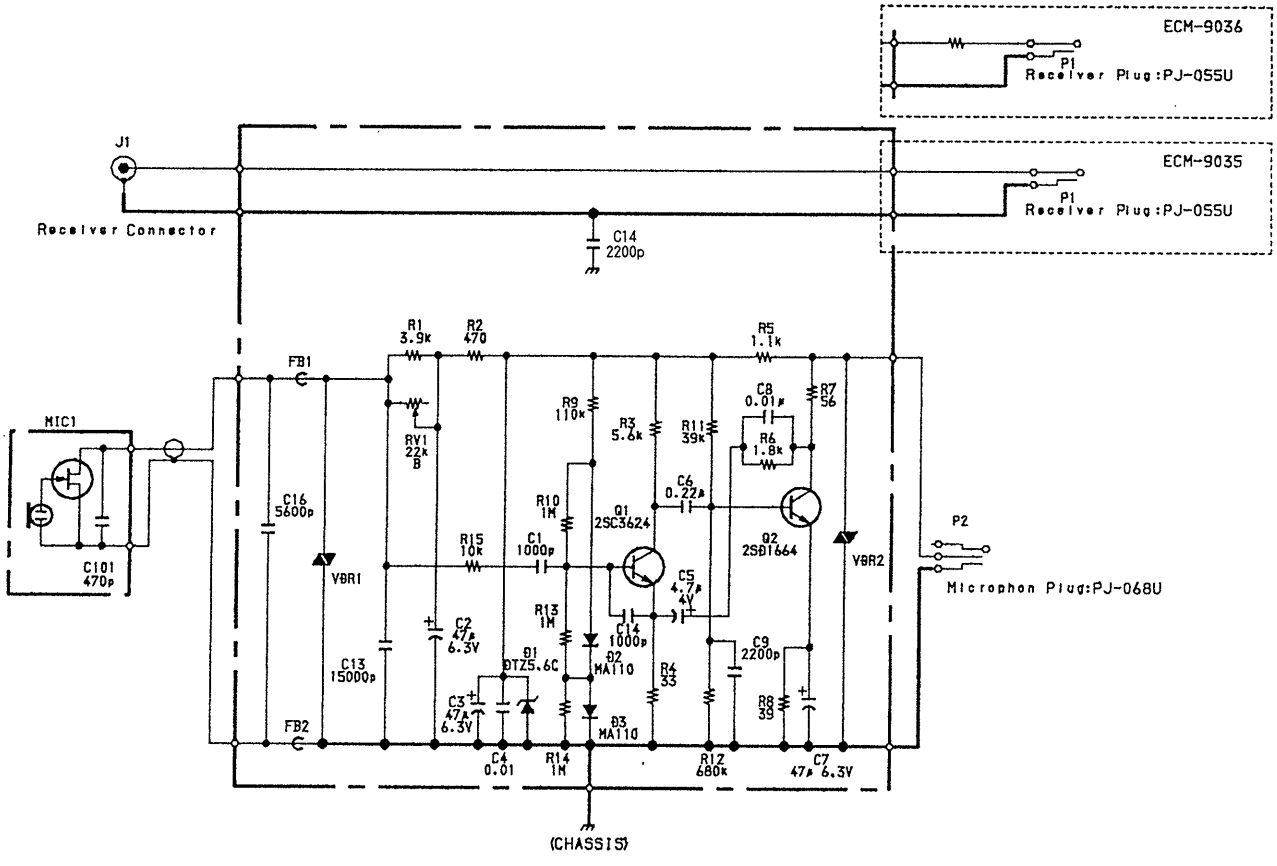


Figure 13. Microphone ECM-9035, ECM-9036 Circuit Diagram

5. Testing (microphone ECM-9030, ECM-9031, ECM-9035, ECM-9036)

A. Microphone Main-Frame Ass'y Checkout (See Figure 14.)

(1) Connect a regulated DC power supply, oscilloscope, and headphone to the microphone main-frame ass'y as shown in Figure 14.

(2) Confirm that the waveforms are appeared in the oscilloscope when inputting audio signal toward the microphone.

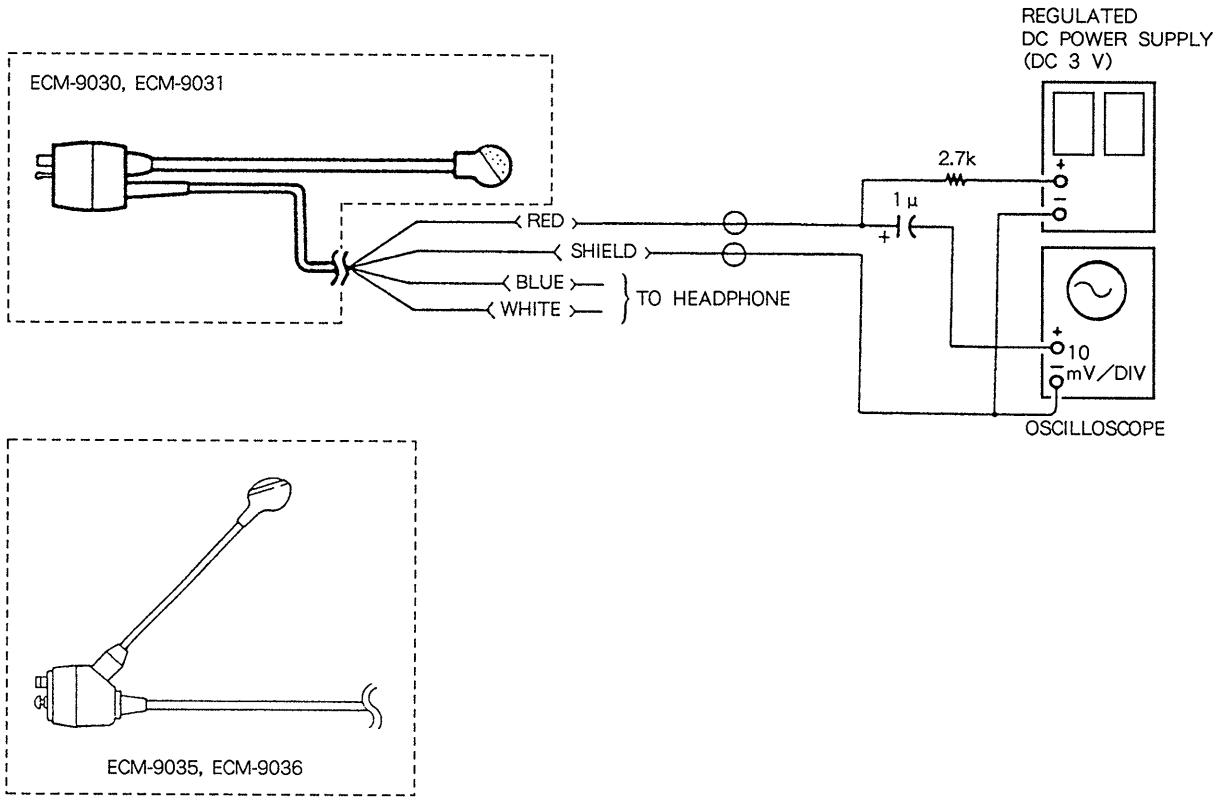


Figure 14. Wiring for Microphone Main-Frame Ass'y

B. Amp Board Mount Checkout (See Figure 15.)

(1) Connect an oscillator, regulated DC power supply, VTVM, and oscilloscope to the amp board mount as shown in Figure 15 and set the power supply voltage to 12 V.

(2) Amp board mount is not defective if the reading on VTVM is 370 to 600 mV.
Confirm that there is no distortion in the waveforms of the oscilloscope, too. If the reading on VTVM is not in the above specifications, change the amp board mount with a new one.

C. Operation Check on Increasing or Decreasing Power Supply Voltage (See Figure 15.)

Consider the reading on VTVM Ⓐ dB when applying 12 V from regulated DC power supply.

- The reading on VTVM should be within Ⓐ − 2 dB when applying 8 V from regulated DC power supply.
- The reading on VTVM should be within Ⓐ +1 dB when applying 16 V from regulated DC power supply.

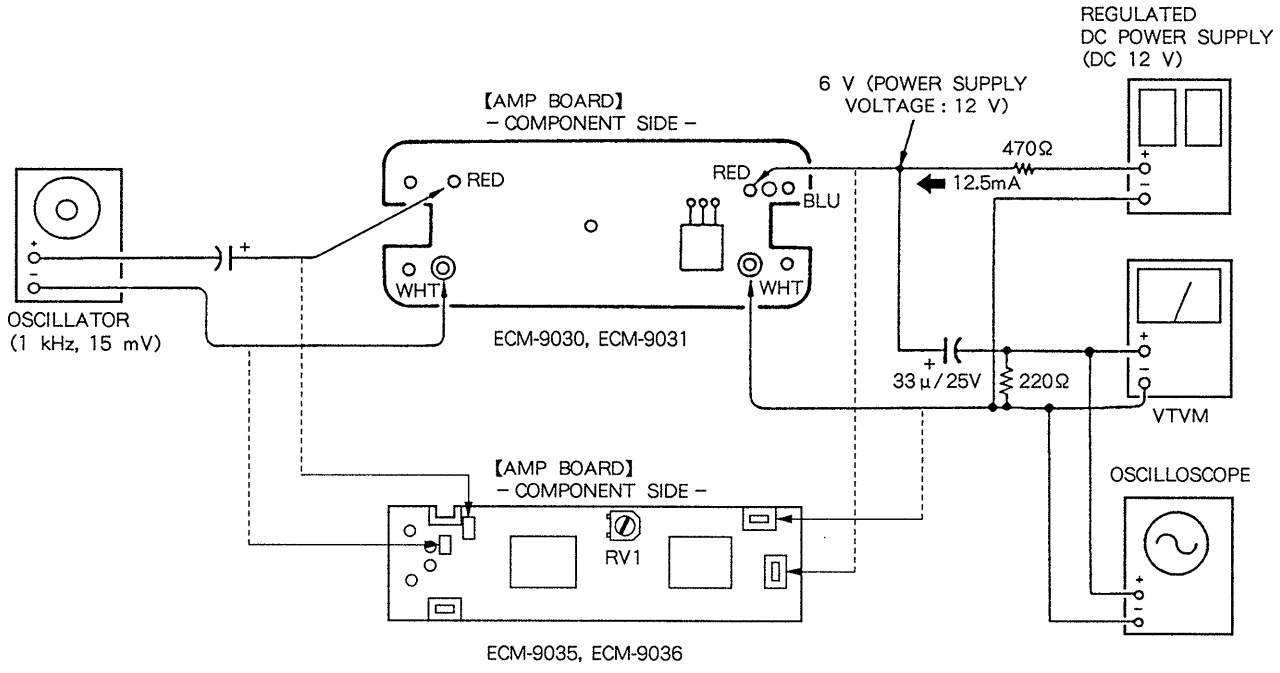


Figure 15. Wiring for Amp Board Mount

6. Illustrated Parts List

A. Introduction

(1) Purpose of parts lists

The illustrated parts list is used to identify and facilitate requistioning of replaceable parts for a microphone ECM-9030, ECM-9031, ECM-9035, ECM-9036 covered by this manual.

(2) Use of parts list when part number is not know

Locate the illustration pertinent to the headset model and identify the part by appearance. Note the item number assigned to the part and check the accompanying parts list to find the item number. Read across the parts list to obtain the part number, nomenclature (description) and required units per assembly.

(3) Use of parts list when part number is known

Turn to the appropriate numerical index and locate the part number. The figure number and item number on the illustration where the part appears are listed to the right of the part number. Turn to the illustration (figure) and locate the item number. The corresponding parts list will give the item number, part number nomenclature (description) and required units per assembly.

(4) Units per assembly

Quantities specified in the "Units per Ass'y" column are the total number of each part required per assembly, and are not necessarily the total used per the complete equipment or a specific set.

(5) * mark

Items marked "*" are not stocked since there are seldom required for routine service.
Some delay should be anticipated when ordering these items.

B. Numerical Index

All parts listed in the illustrated parts list are listed in the numberical index and are arranged in alpha-numerical order. All parts are listed with total quantities per unit and with reference to figure and item numbers indicating the locations of these parts.

C. Illustrated Parts List

The illustrated parts list does not list or illustrate parts which lose their identity by being permanently attached to other pieces.

ECM-9030, ECM-9031

FIG. ITEM	PART NUMBER	DESCRIPTION	UNIT PER ASSY
1	2-387-728-11	CASE BUSHING	1
2	*2-538-425-01	AMP CASING (B)	1
3	7-682-148-09	SCREW +P 3x8	1
4	X-2538-402-1	CLIP ASS'Y	1
5	A-4581-030-A	MICROPHONE MAIN-FRAME ASS'Y	1
6	2-538-431-01	BUSHING	1
7	3-847-356-02	CLAMP	2
901	A-4518-282-A	AMP BOARD MOUNT	1
902	X-2538-404-1	PLUG (A) ASS'Y (FOR MICROPHONE)	1
903	X-2538-405-1	PLUG (B) ASS'Y (FOR RECEIVER) (ECM-9030)	1
903	X-4942-148-1	PLUG (B) ASS'Y (FOR RECEIVER) (ECM-9031)	1
R1	1-247-837-00	CARBON RESISTOR 1.8KΩ 5% 1/4W	1
R1	1-247-839-00	CARBON RESISTOR 2.2KΩ 5% 1/4W	1
R1	1-247-841-00	CARBON RESISTOR 2.7KΩ 5% 1/4W	1
R1	1-247-843-00	CARBON RESISTOR 3.3KΩ 5% 1/4W	1

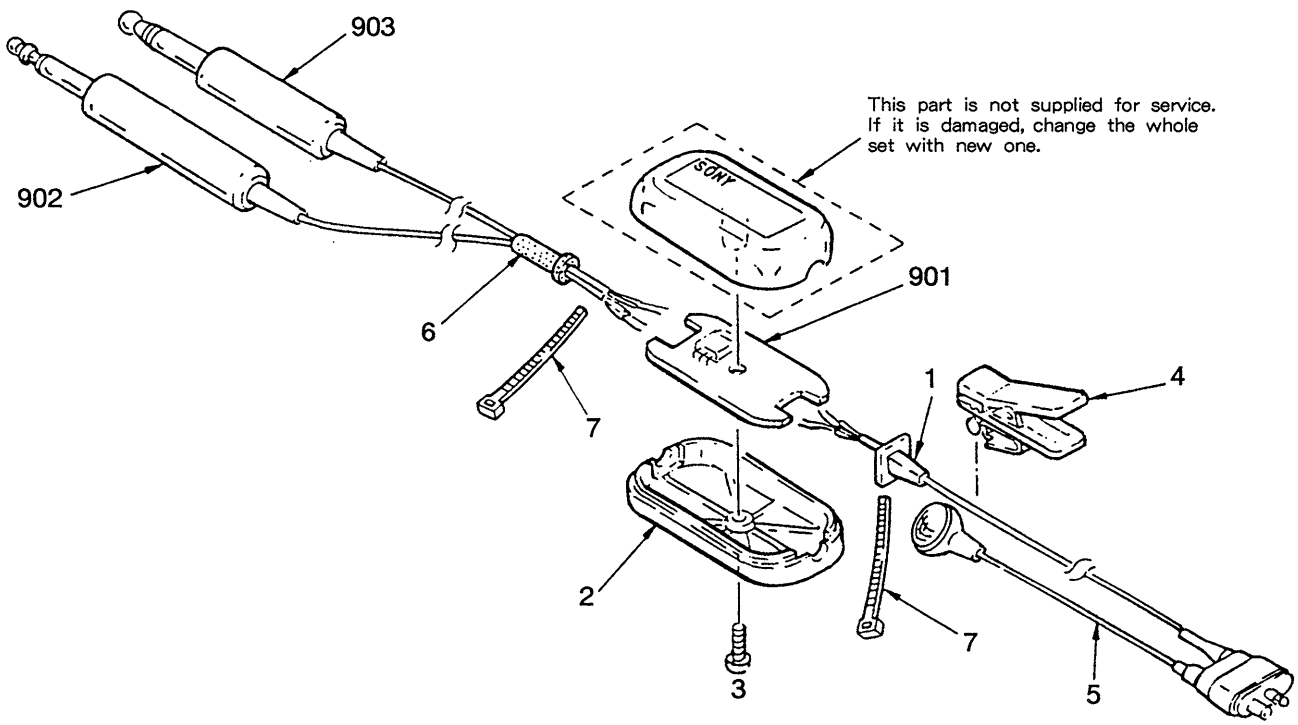


Figure 16. Microphone ECM-9030, ECM-9031 Exploded View

ECM-9035, ECM-9036

FIG. ITEM	PART NUMBER	DESCRIPTION	UNIT PER ASSY
1	A-4535-062-A	MICROPHONE MAIN-FRAME ASS'Y	1
2	2-056-666-11	PURCE LOCK (ϕ8)	1
3	4-969-104-11	GRIP	1
4	4-969-105-01	SHIELD CASE	1
5	X-4945-213-1	PLUG SUB ASS'Y	1
6	A-4542-239-A	AMP BOARD MOUNT	1
7	7-632-397-81	SILICONE TUBE (ϕ1)	1
8	1-764-447-11	PLUG (B) (ECM-9035)	1
8	1-764-447-21	PLUG (B) (ECM-9035)	1
9	X-2538-402-1	CLIP ASS'Y	1

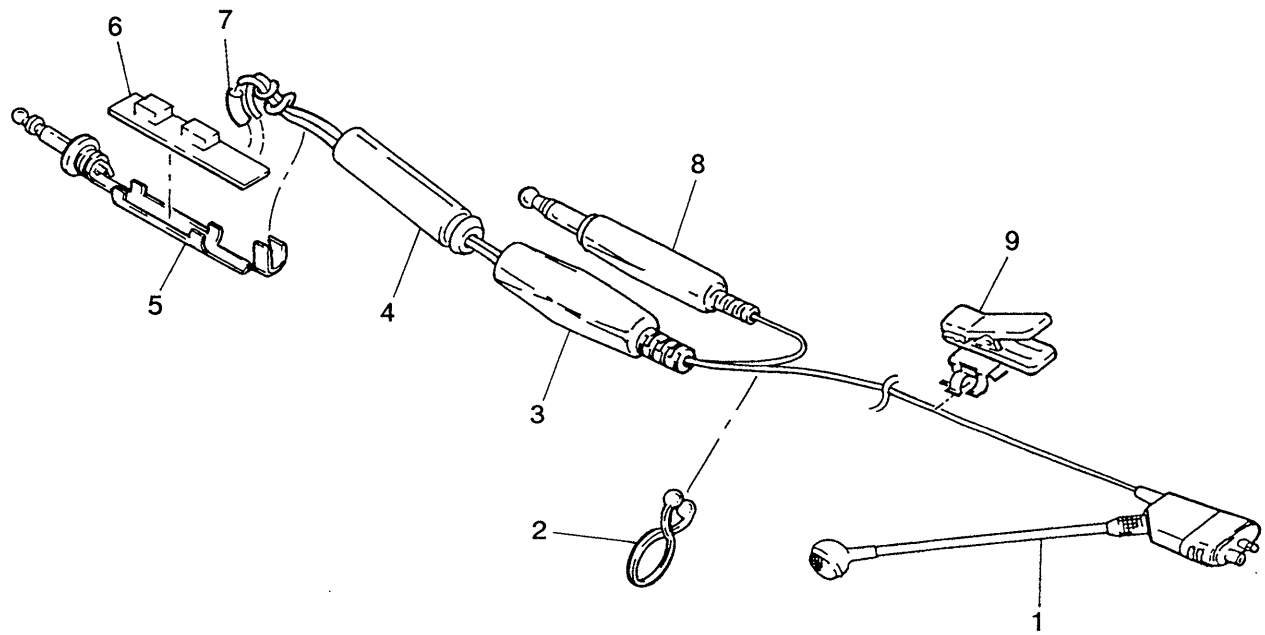


Figure 17. Microphone ECM-9035, ECM-9036 Exploded View

English
94F05001-1
Printed in Japan
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3-956-819-31

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Personal A&V Products Div.

Published by Home A&V Products Div.
Quality Engineering Dept.